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The Influenza Epidemic of 1928-1929 with Comparative Data for 1918-1919*

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THE influenza epidemic of the winter of 1928–1929 was by no means the first outbreak since 1918. To get some idea of what has been happening to the influenza-pneumonia death rate during the past decade, weekly data for a group of about 95 cities† have been studied. These cities with an aggregate population of over 30,000,000 are distributed throughout the United States. In order to get a workable population group in such sections as the Mountain States, some cities as small as 12,000 are included. The aggregate population of the 68 cities that had a population of 100,000 or more in 1920 is about the same as the aggregate population of these 95 cities, but the latter group is considerably more representative of the different sections of the country.

In the upper half of Figure I the weekly death rates from influenza and pneumonia combined have been plotted. The dotted line represents the weekly median or expected rate.‡ In the lower half the excess over the median rates have been plotted as an approximation of the extent of the influenza-pneumonia deaths due to the epidemics.

It will be seen that since January 1, 1920, there have occurred six

* Summary of a paper presented before the Epidemiology Section of the American Public Health Association at the Fifty-eighth Annual Meeting at Minneapolis, Minn., October 1, 1929.

† Death rates from influenza and from pneumonia for this group of cities have been published weekly in the *Public Health Reports* since January 1, 1925. Published and unpublished reports of deaths in these cities enabled us to carry the record for a large proportion of the cities back to January 1, 1920. Although some of the cities are not included in the earlier years, the group is for the most part identical for the different years.

‡ It may be seen from Figure I that if the epidemic peaks are left out of consideration there is little if any trend either up or down in the actual influenza-pneumonia death rates. The median influenza-pneumonia weekly death rate was, therefore, taken as the "normal," the medians being based on the 7-year period 1921–1927 inclusive. As there was some chance variation in this median rate, the 52 medians, representing the 52 weeks of the calendar year, were smoothed by a 5-period moving average.

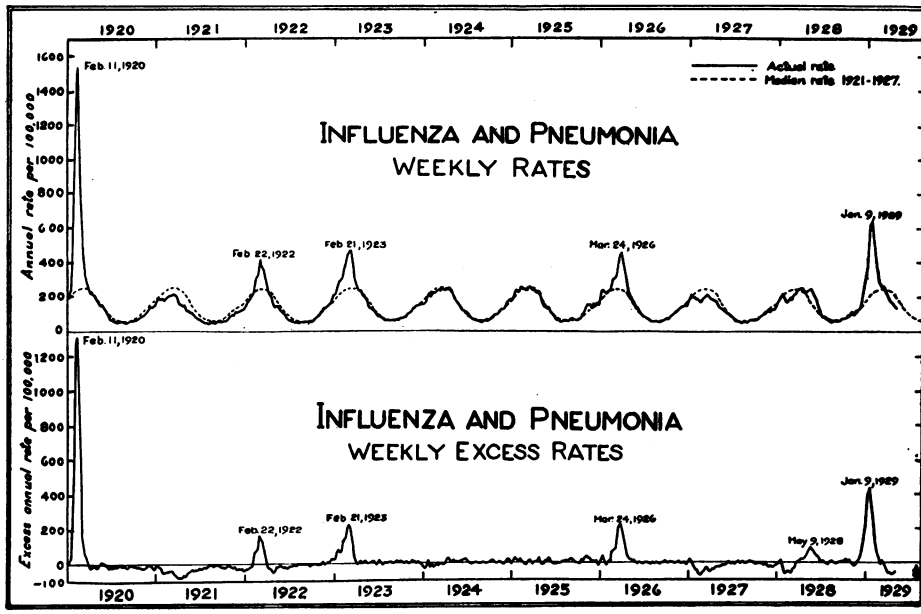

FIGURE I—Weekly total and excess influenza-pneumonia mortality in a group of about 95 cities in the United States, 1920–1929. Dates on graph are middle (Wednesday) of the peak weeks. (Excess over median rates for corresponding weeks for the period 1921–1927. The 52 medians representing "normal" or "expected" rates for the different weeks of the year were smoothed by a 5-period moving average before the excesses were computed.)

more or less definite epidemics. The epidemic of 1928–1929 was the most important since that of 1920. The peaks of these six epidemics occur all the way from the early part of January to the early part of May, and the peak of the pandemic of 1918–1919 occurred much earlier in the fall than was the case in 1928–1929.

The severity of each of the epidemics may be judged to a considerable extent by the weekly excess rates (as given in Figure I), but a more accurate measure would be the total excess rate during the whole period of the epidemic. Table I shows this total excess rate for each of the six epidemics that have occurred since January 1, 1920. Unlike the weekly rates, those in Table I are not on an annual basis.

It will be noted that as measured in total mortality from influenza and pneumonia, the epidemic of 1928–1929 was almost half of that of 1920. If the excess rates as found in these 95 cities are at all representative of the country as a whole, something like 50,000 influenza-pneumonia deaths in the United States occurred during the epidemic of the winter of 1928–1929 in excess of the normal expected number from those causes. The figure for 1920, in agreement with previous estimates, is about 100,000 excess influenza-pneumonia deaths. Dur-

ing the 1918–1919 pandemic, it has been estimated that about 500,000 influenza-pneumonia deaths occurred in this country in excess of the normal expected number, so that the recent epidemic of 1928–1929 caused only about one-tenth as many deaths as the great pandemic. It will be recalled that during the winter of 1918–1919 the influenza-pneumonia death rate remained high for a long period after the peak of the epidemic; in fact, during a period of eight or nine months the death rate was very much above normal.

Table I also shows for each of the geographical sections the total excess rates * during each of the epidemics since 1920. In the 1928–

TABLE I

TOTAL EXCESS * INFLUENZA-PNEUMONIA DEATH RATE PER 100,000 DURING THE WHOLE OF EACH EPIDEMIC IN CITIES OF THE DIFFERENT GEOGRAPHIC SECTIONS OF THE UNITED STATES, 1920–1929

Geographic section	Epidemic of:					
	1920	1922	1923	1926	Spring of 1928	Winter of 1928–1929
All cities	99.3	18.3	29.9	25.3	11.6	44.4
New England	96.6	29.5	36.6	30.0	15.4	42.3
Middle Atlantic	95.2	24.7	26.5	41.2	20.9	43.0
South Atlantic	94.2	9.4	42.7	26.2	none	47.6
East North Central	109.4	11.4	32.2	22.2	17.9	43.7
East South Central	99.1	16.0	44.0	38.2	11.9	92.0
West North Central	121.9	34.8	53.3	none	4.9	42.8
West South Central	91.2	14.6	6.7	58.8	13.7	68.2
Mountain	159.5	36.2	17.6	16.8	7.7	68.7
Pacific	57.7	36.3	11.3	9.3	none	43.0

* Excess over the median rates for corresponding weeks for the period 1921–1927. The series of 52 medians representing "normal" or "expected" rates for the different weeks of the year were smoothed by a 5-period moving average before the excesses were computed. It should be noted that the rates in this table, unlike the rates shown in Figure I, are not on an annual basis.

Because the rates in non-epidemic weeks of 1922 are nearly all lower than the median rate 1921–1927, a correction was made for that epidemic by measuring the excess not over the zero base line representing the median rate (Figure I) but over a line parallel to the base line but 25 points (in the rate per 100,000) below it. The amount of this correction varied in the different geographic areas.

1929 epidemic the excess rates in six of the nine sections were practically the same, varying only from 42 to 48 per 100,000. In three sections, the East South Central, West South Central and Mountain, the rates were considerably higher than in the other six sections, the East South Central cities having a particularly high rate.

It will be recalled that, so far as the country as a whole was concerned, the 1922 epidemic was rather small, the epidemics of 1923 and

* Median or expected rates and excesses above those rates were computed for each section in the manner already outlined in connection with the cities considered as a whole.

1926 both being somewhat larger. It will be noted that on the Pacific Coast the 1922 epidemic was rather large, the total excess rate being about four-fifths of the corresponding rate in the 1928–1929 epidemic. The epidemics of 1923 and 1926 were very small in the Pacific coast cities. In the East South Central section the total excess death rate in the 1928–1929 epidemic was nearly as large as that of the 1920 epidemic.

Each of the six epidemics that have been noted as occurring since January 1, 1920, appeared to some extent in nearly all of the nine sections. However, a few sections showed a considerable excess during years that, so far as the country as a whole was concerned, were considered relatively free from influenza. For example, in 1925 the West South Central section showed excess death rates as great as occurred in many sections during the years 1922, 1923 and 1926.

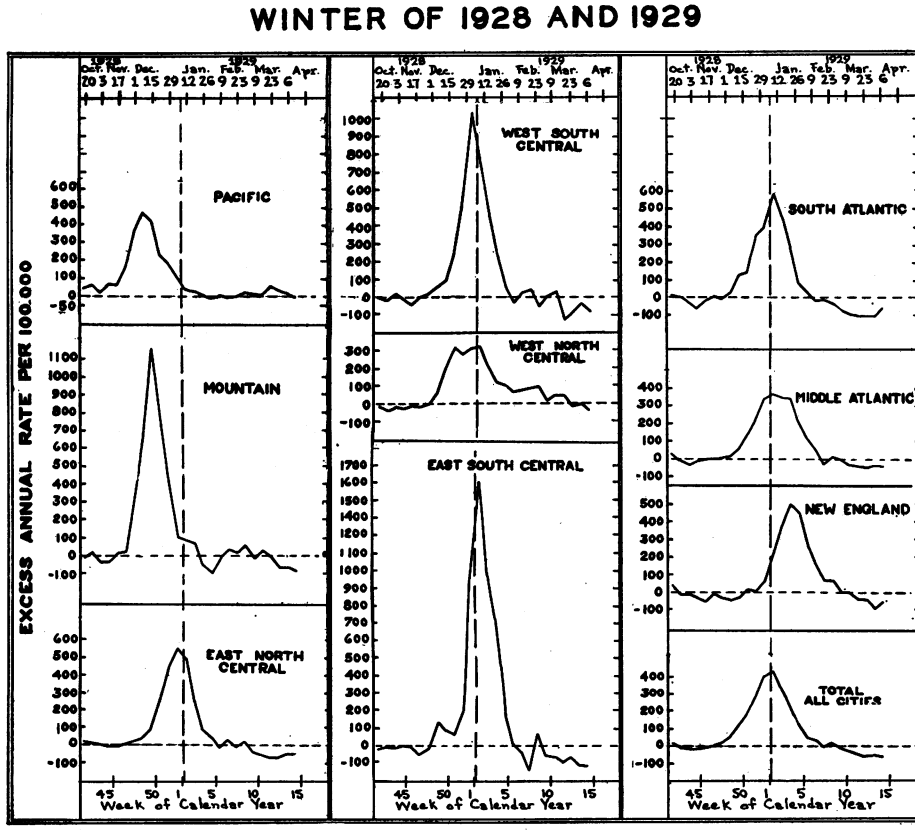

FIGURE II—Weekly excess influenza-pneumonia mortality in a group of cities in each geographic section of the United States during the epidemic of the winter of 1928–1929. Sections arranged in order of dates of peak mortality as shown in Figure III. (Excess over median rates in the same geographic section for corresponding weeks for the period 1921–1927.)

In Figure II the weekly excess rates for each geographic section are plotted for the short period in the winter of 1928–1929, during which influenza was epidemic. The broken vertical line represents the peak date of the epidemic when the total 95 cities are considered as a group, the excess rates for the whole group being plotted in the lower right hand section of the figure. The peak of the excess mortality occurred on the Pacific Coast early in December. The different sections following the Pacific Coast are arranged in the order of the occurrence of the peaks. Reading the sections down the graph it may be seen that the epidemic followed a very regular course from west to east, ending in New England with a peak about seven weeks later than that on the Pacific Coast.

In contrast to the 1928–1929 epidemic, the 1920 epidemic spread over the country in a very much shorter time. This epidemic apparently started in the East North Central States, around Chicago, from which it traveled east, west and south, ending in the East South Central States with a peak date only about two or three weeks after that in the first section. Figure III shows on a map the starting place and spread of the epidemics of 1920 and of 1928–1929.

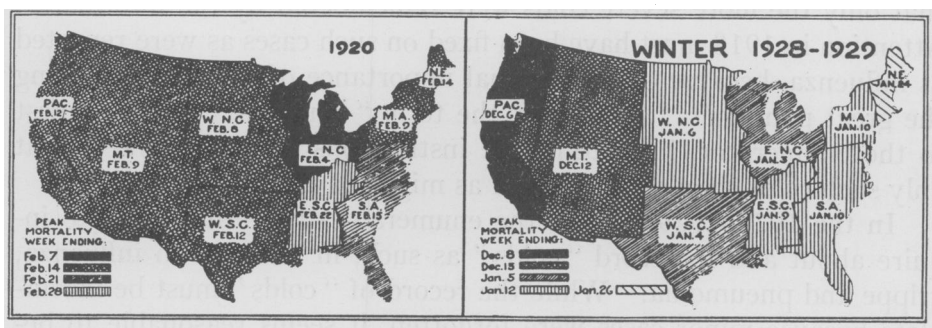

FIGURE III—Time of occurrence of two influenza epidemics in cities of different geographic sections of the United States. Darkest sections were first, and lightest sections were last to be affected. (Dates represent estimated peak days for the section, the estimate being made by interpolation within the peak week when account is taken of the rates for the two adjacent weeks.)

The 1926 epidemic, like the recent one of 1928–1929, apparently started on the Pacific Coast. The 1923 epidemic started in the East South Central section and spread rather slowly to other sections of the country. The spread of the epidemics of 1922 and of the spring of 1928 was rather indefinite but the former appears to have started in the East, probably in the Middle Atlantic section, and the latter in the West, probably in the Mountain section. There is, then, no one section where epidemics usually start; in the six epidemics the start has occurred in five different sections.

INFLUENZA MORBIDITY * AS INDICATED BY SPECIAL SURVEYS, 1928–1929 AND 1918–1919

Immediately after the 1928–1929 epidemic the U. S. Public Health Service made surveys in 10 cities in the United States similar to surveys made in about an equal number of cities in 1918–1919. In cooperation with state health departments, some small towns and rural communities were surveyed in Missouri, New York, and Massachusetts. The selected localities of the two epidemics were not identical, but the incidence rates probably give a fairly accurate idea of the number of cases in the two epidemics.

House to house canvasses were made of selected districts with a total population of 10,000 to 15,000 persons in each of the cities to be surveyed.† The two surveys were made along generally comparable lines, but there were some differences in the methods used. In the 1918–1919 survey, the enumerators were instructed to class as influenza such reported "colds" as lasted three days and kept the patient in bed one whole day, unless the case had been otherwise diagnosed by a physician. Other colds were to be recorded as "doubtful," but the number of such doubtful cases reported was so small that it appears that only the more severe colds were remembered by the informants. Attention in 1918 must have been fixed on such cases as were reported as influenza, because of the unusual importance of the disease during the great pandemic. Moreover, the term "doubtful" would suggest to the enumerator, in spite of the instructions to the contrary, that only such colds should be included as might have been influenza.

In the 1928–1929 survey, the enumerators were instructed to inquire about and to record "colds" as such, in addition to influenza, grippe and pneumonia. While the record of "colds" must be incomplete because minor cases were forgotten, it seems reasonable to believe that it contains a larger proportion of the colds that actually occurred than was true of the "doubtful" category of the 1918–1919 surveys. We have accordingly classified the colds reported in the 1928–1929 survey into those causing one or more days in bed and those in which the patient was not confined to bed. For purposes of comparison with the 1918 surveys these colds in bed have generally been included with influenza, pneumonia and grippe as more nearly approximating the influenza, pneumonia and doubtful category of the 1918 data.

Of the cases definitely classified as influenza or grippe, the 1928–

* The data in this section are preliminary and subject to minor changes in later reports.

† For a more detailed statement of the methods, see Veldee, M. V., Morbidity in the Influenza Epidemic of 1928–1929—Preliminary Report on Surveys in Various Cities, *Pub. Health Rep.*, 44, 19 (May 10), 1929. (*Reprint 1282.*)

1929 rate of 145 per 1,000 persons canvassed is somewhat more than one-half of the rate of 242 per 1,000 in the 1918–1919 epidemic. In the 1918–1919 epidemic the incidence of pneumonia was 16.4 per 1,000, or more than three times the rate of 4.7 cases per 1,000 in 1928–1929. The incidence rate for the group of cases classified as "doubtful," 21.5 per 1,000, in the 1918–1919 surveys was only about half the rate of 39.6 per 1,000 for colds with one or more days in bed in the 1928–1929 epidemic. In addition, there was reported in 1928–1929 a large number of colds (76.6 per 1,000) that involved no days in bed. Considering all the respiratory conditions together, the rate in 1928–1929 was not far different from what it was in 1918–1919, but, as already noted, the 1928–1929 data appear to include a considerably larger proportion of the cases of common colds, such as occur during every winter, than is true of the 1918–1919 data.

Table II shows the case rate for each of the localities surveyed in 1928–1929 and in 1918–1919. Although the localities were not the same in the two surveys (only three surveyed in 1918–1919 were surveyed in 1928–1929), the general picture is perhaps comparable. In this table colds involving one or more days in bed have been included with influenza, grippe and pneumonia because, as already stated, that combination appears to be more nearly comparable to the 1918 data which include influenza, grippe, pneumonia and "doubtful." Another disturbing element is the fact that the period for which respiratory

TABLE II

INCIDENCE OF INFLUENZA AND GRIPPE * IN EACH OF A GROUP OF LOCALITIES SURVEYED IN 1928–1929 AND IN EACH OF A GROUP OF LOCALITIES SURVEYED IN 1918–1919

1928–1929	Case rate per 1,000 persons canvassed	1918–1919	Case rate per 1,000 persons canvassed
All localities	189	All localities	280
Des Moines, Ia.	304	San Antonio, Tex.	535
Minor Towns	252	Minor Md. Towns	405
Seattle, Wash.	222	Little Rock, Ark.	359
Kansas City, Mo.	188	Augusta, Ga.	341
Pittsburgh, Pa.	181	Baltimore, Md.	246
New Orleans, La.	181	Des Moines, Ia.	231
Syracuse, N. Y.	177	San Francisco, Calif.	215
San Francisco, Calif.	161	Spartanburg, S. C.	214
Cincinnati, O.	159	Macon, Ga.	213
Boston, Mass.	154	New London, Conn.	185
Baltimore, Md.	138	Louisville, Ky.	150

* 1928–1929 cases include influenza, grippe, pneumonia and colds with one or more days in bed; 1918–1919 cases include influenza, grippe, pneumonia and "doubtful."

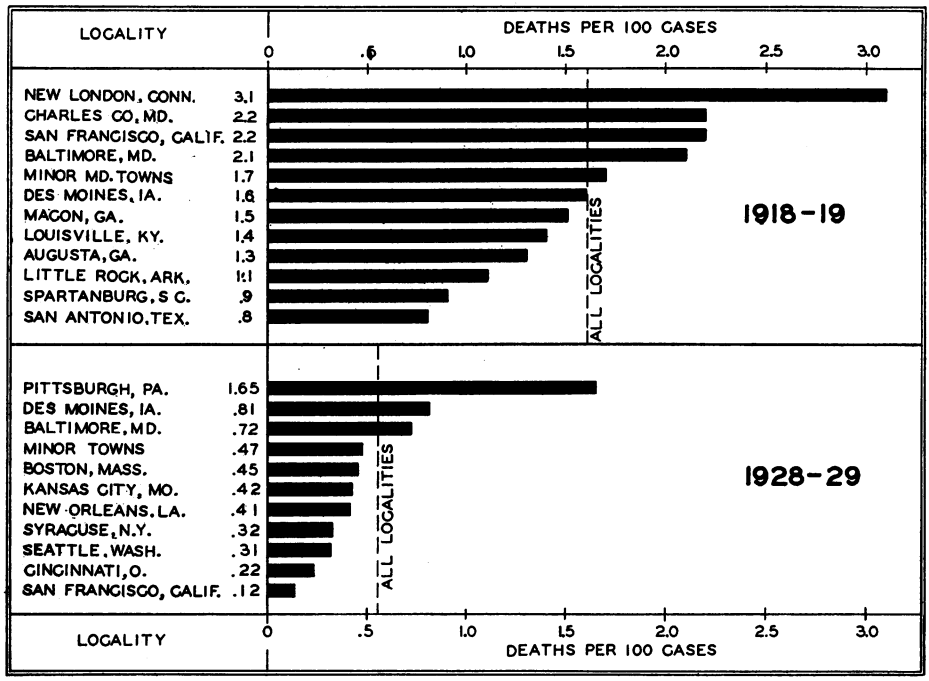

FIGURE IV—Case fatality of influenza and grippe in each of a group of localities surveyed in 1928–1929 and in each of a group of localities surveyed in 1918–1919. (Cases in 1928–1929 include influenza, grippe, pneumonia and colds with one or more days in bed; 1918–1919 cases include influenza, grippe, pneumonia and "doubtful.")

attacks were recorded varied in the different localities. In spite of these possibilities of error, it is believed that the data in Table II give a fair picture of the extent and variation of the influenza morbidity rates in a few fairly representative localities in the two epidemics.

The case fatality is hard to determine because it is difficult to estimate how many cases of influenza occurred. Considering all surveyed localities together, the case fatality in the 1928–1929 epidemic was 0.70 per cent if the deaths are related to only the cases definitely reported as influenza, grippe or pneumonia. If the colds that involved one or more days in bed be added to these cases as possible influenza, then the fatality becomes 0.56 per cent. If all colds as well as influenza and grippe be considered as a unit, the fatality is 0.40 per cent. Considering these three statements, it may be said that the case fatality in 1928–1929 was somewhere between one-fourth and one-half of that shown by the surveys of 1918–1919 (1.6 per cent).

Figure IV shows the case fatality for each of the surveyed localities in 1928–1929 and for each of those surveyed in 1918–1919. It may be seen that only one locality, Pittsburgh, reached as high a fatality in 1928–1929 as the average for all surveyed localities in 1918–1919.

As regards the proportion of cases complicated by pneumonia, the percentage also varies according to what type of respiratory attacks are considered as influenza or at least doubtful influenza. In the 1918–1919 epidemic about 6 per cent of the cases were complicated by pneumonia, against from 2 to 3 per cent in that of 1928–1929.

In the 1918–1919 epidemic, the deaths constituted 25 per cent of the cases of pneumonia and in 1928–1929, 21 per cent. It appears, therefore, that the great difference in the fatality of influenza and grippe is due to the difference in the percentage of cases complicated by pneumonia.

TABLE III

PERCENTAGE OF INFLUENZA AND GRIPPE * CASES THAT WERE COMPLICATED BY PNEUMONIA IN EACH OF A GROUP OF LOCALITIES SURVEYED IN 1928–1929 AND IN EACH OF A GROUP OF LOCALITIES SURVEYED IN 1918–1919

1928–1929	Per cent of cases complicated by pneumonia	1918–1919	Per cent of cases complicated by pneumonia
All localities	2.6	All localities	6.3
Pittsburgh, Pa.	4.5	Des Moines, Ia.	10.2
Boston, Mass.	3.5	New London, Conn.	9.3
Baltimore, Md.	3.5	San Francisco, Calif.	8.0
Kansas City, Mo.	3.3	Baltimore, Md.	7.3
Syracuse, N. Y.	2.4	Minor Md. Towns	6.4
Minor Towns	2.4	Louisville, Ky.	6.2
Cincinnati, O.	2.4	Macon, Ga.	6.1
Des Moines, Ia.	2.2	Augusta, Ga.	4.5
New Orleans, La.	2.0	San Antonio, Tex.	4.5
Seattle, Wash.	1.6	Little Rock, Ark.	4.5
San Francisco, Calif.	1.5	Spartanburg, S. C.	3.1

* 1928–1929 cases include influenza, grippe, pneumonia and colds with one or more days in bed; 1918–1919 cases include influenza, grippe, pneumonia and "doubtful."

Table III shows the percentage of cases that were complicated by pneumonia. In 1918–1919 nearly 10 per cent of the cases reported in Des Moines were complicated by pneumonia and the average for all of the surveyed localities was nearly 6 per cent. In 1928–1929 the highest percentage of cases complicated by pneumonia was 4.5 for Pittsburgh—a figure considerably below the average of the surveyed localities in 1918–1919.

Figure V shows the age incidence of influenza and grippe in all localities surveyed in 1918–1919 and in 1928–1929. The very high incidence under 30 years of age and the rather rapid decline in the incidence as age increased, which were characteristic of the 1918–1919 epidemic, are not found in the 1928–1929 data. There is, however, one point of similarity—a rather high incidence under 10 years

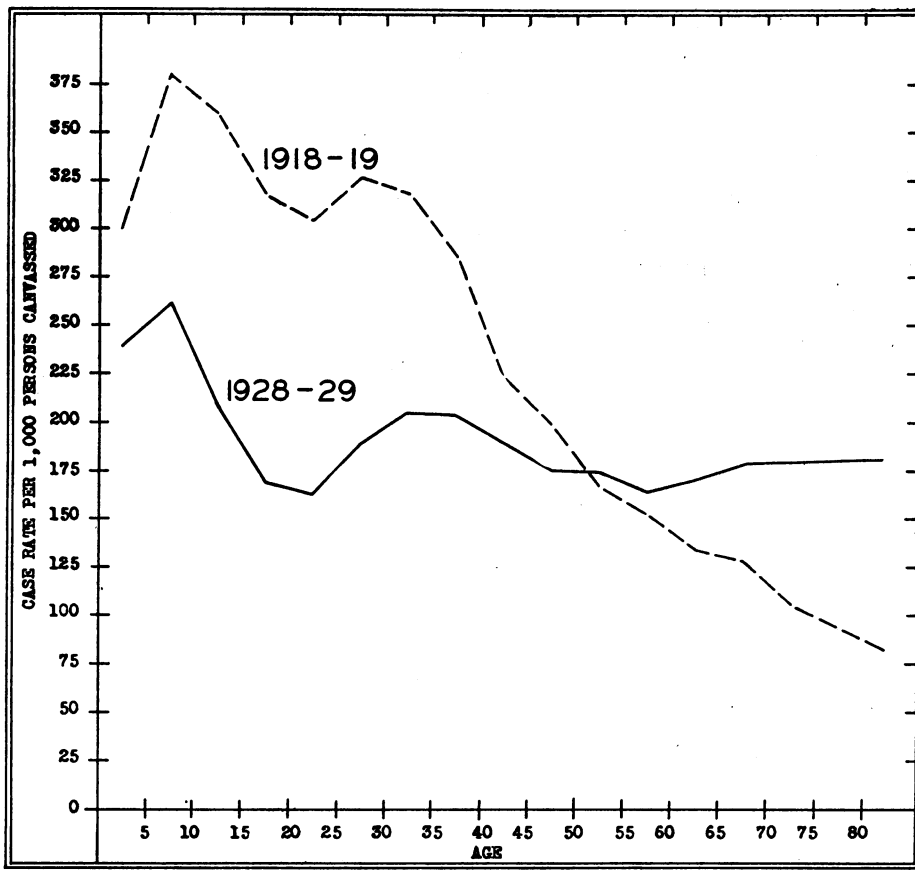

FIGURE V—Age incidence of influenza and grippe in a group of localities surveyed in 1928–1929 and in a group of localities surveyed in 1918–1919. (Cases in 1928–1929 include influenza, grippe, pneumonia and colds with one or more days in bed; 1918–1919 cases include influenza, grippe, pneumonia and "doubtful.")

of age followed by a considerable drop to a minimum from 15 to 25 years with a rise and a second peak around 30 to 40 years of age. This type of curve seems to run quite consistently through all the localities in 1928–1929. Although not reproduced here, that in general was the description of the age curve of influenza that occurred in Baltimore, Md., during the epidemic of 1920 and in Hagerstown, Md., during the epidemics of 1922 and 1923.[1] It might be stated that the age curves of influenza and of grippe in the 1928–1929 data are very similar, both showing peaks at 5 to 9 and again at 30 to 40 years of age. The age curves for all colds and for colds with one or more days in bed, however, are quite different from the curve for influenza and grippe.

SUMMARY

Influenza-pneumonia mortality data for 95 cities representing all sections of the United States indicate that since January 1, 1920, six

definite epidemics have occurred. If the excess rates in these cities are at all representative of the country as a whole, about 50,000 influenza-pneumonia deaths occurred in the United States during the epidemic of the winter of 1928–1929 in excess of the normal number from those cases. During the six epidemics between 1920 and 1929, somethink like 250,000 excess influenza-pneumonia deaths occurred in this country—equal to about half of the 500,000 excess influenza-pneumonia deaths in the United States during the pandemic of 1918–1919.

The case incidence of influenza and grippe in the 1928–1929 epidemic as determined by the special surveys, seemed to be more than half of that of 1918–1919. The percentage of cases complicated by pneumonia and the case fatality, however, were much less in the recent epidemic, being in 1928–1929 somewhere between one-fourth and one-half of the corresponding figures for 1918–1919.

REFERENCE

1. Sydenstricker, Edgar. The Incidence of Various Diseases According to Age, Hagerstown Morbidity Studies No. VIII, *Reprint 1227, Pub. Health Rep.*, 43, 19 (May 11), 1928.

EXPLANATION: In this paper the terms "influenza" and "influenza-pneumonia" designate the classifications in the recorded mortality that were used and are not intended to suggest that the various respiratory epidemics were necessarily etiologically the same.

NOTE: In the preparation of this paper I have had the advice and assistance of W. H. Frost, M.D., Consultant, and Statistician Edgar Sydenstricker, who, with the author, constitute a board for the study of respiratory diseases appointed by the Surgeon General of the U. S. Public Health Service. Some of the charts here presented will be included in a more detailed article including tabular material which will be published by the Service.

"Bargain" Eyeglasses Ruin the Eyes

THE National Society for the Prevention of Blindness and the National Better Business Bureau have recently called attention to the fact that certain mail order houses are selling spectacles by mail and that thousands of persons are endangering their eyesight by the use of such glasses which strain instead of aid the vision.

This warning is fully justified, but the organizations in question might well have called attention at the same time to the equally bad practice by department and five and ten cent stores of selling eyeglasses which are fitted (?) by inexperienced salespersons. This practice is a violation of the Education Law in New York State, the legality of which was recently upheld by the Supreme Court of the United States.—*Health News*, Nov. 25, 1929.